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Serial No. 10/002,746

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RESPONSE UNDER 37 CFR
1.116 EXPEDITED PROCEDURE
- EXAMINING GROUP 2685 -

IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE

Patent Application

Inventors Arnab Das
Farooq Ullah Khan

Case 14-18

Serial No. 10/002,746

Filing Date November 2, 2001

Examiner Thuan T. Nguyen

Group 2685

Title Variable Rate Channel Quality Feedback in a Wireless Communication System

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

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Gregory J. Morgia

Date

Response After Final Under 37 CFR 1.116

Sir:

In response to the Final Office Action dated May 5, 2004, Applicants respectfully request entry and consideration of this response, in which:

Listing of Claims begin on page 2 of this paper, and
Remarks begin on page 4 of this paper.

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Listing of Claims

1. (Previously Presented) A method for transmitting channel quality information in a wireless communication system comprising at least one base station and at least one mobile station, the method comprising:

varying a rate for reporting channel quality information from a mobile station to a base station as a function of the presence or absence of a reception of a data transmission at the mobile station, wherein the mobile station reports channel quality information at a first rate in the absence of a reception of a data transmission from the base station and, upon detection of a reception of a data transmission from the base station, the mobile station reports channel quality information at a second rate for a prescribed duration.

2. (Canceled)

3. (Canceled)

4. (Previously Presented) The method according to claim 1, wherein, upon detection of a reception of a data transmission from the base station, the mobile station reports channel quality information at a plurality of rates over a prescribed time period after detection of the reception of a data transmission, wherein the plurality of rates are different than the first rate.

5. (Previously Presented) The method according to claim 4, wherein the prescribed time period includes a plurality of time intervals such that the channel quality information is reported at different ones of the plurality of rates during different ones of the plurality of time intervals.

6. (Previously Presented) The method according to claim 1, wherein the second rate is faster than the first rate.

7. (Previously Presented) The method according to claim 1, further comprising the step of estimating channel quality at the base station while the mobile station is reporting at the second rate, wherein estimated channel quality is used to derive a transmission format for a subsequent transmission.

8. (Original) The method according to claim 7, wherein the transmission format includes one or more parameters selected from the group consisting of modulation format, number of codes, and transmission rate.

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9. (Previously Presented) The method according to claim 1, further comprising the step of estimating channel quality at the base station while the mobile station is reporting at the second rate, wherein estimated channel quality is used to calculate an amount of redundancy needed for a retransmission of a previous data transmission.

10. (Original) The method according to claim 1, wherein the channel quality information comprises a transmission rate calculated by the mobile station based on one or more channel conditions.

11. (Previously Presented) A method for adapting the rate of reporting channel quality information in a wireless communication system including at least one base station and at least one mobile station, the method comprising:

reporting channel quality information from the at least one mobile station to the at least one base station at a first rate in the absence of a reception of a data transmission at the at least one mobile station; and

in the presence of a reception of a data transmission at the at least one mobile station, adapting the rate for reporting channel quality information from the at least one mobile station to the at least one base station from the first rate to a second rate for a prescribed duration.

12. (Original) The method according to claim 11, wherein the second rate is faster than the first rate.

13. (Original) A method for transmitting channel quality information in a wireless communication system including at least one base station and at least one mobile station, the method comprising:

varying a rate for reporting channel quality information from a mobile station to a base station as a function of the number of base stations that the mobile station is communicating with.

14. (Original) The method according to claim 13, wherein the mobile station reports channel quality information at a first rate when the mobile station is communicating with one base station and wherein the mobile station reports channel quality information at a second rate when the mobile station is communicating with a plurality of base stations.

15. (Original) The method according to claim 14 wherein the second rate is faster than the first rate

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REMARKS

Claims 1 and 4-15 remain pending in the application for further consideration by the Examiner. Applicants respectfully request that the Examiner enter this response after Final Office Action since it is believed that the remarks provided herein overcome all rejections and that the application stands in condition for allowance.

35 U.S.C. 102(b) Rejection

Claims 1 and 4-15 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 6,067,458 ("Chen"). All rejections are traversed for the reasons set forth below.

Claims 13-15

Applicants submit that claims 13-15 are not anticipated by Chen. As a preliminary matter, neither the Final Office Action nor the previous Office Action sets forth with any particularity how the specific limitations recited in these claims are anticipated by Chen. In both Office Actions, the rejection of claims 13-15 was supported only by reference to the reasons used for rejection of claims 1-10 in the Office Action without any acknowledgement of the different, additional limitations in claims 13-15. Secondly, the Final Office Action did not address Applicants' arguments provided in the previous Office Action response with regard to the distinctions between claims 13-15 and the Chen reference. Accordingly, Applicants respectfully submit that entry of this Response After Final is appropriate for at least this reason.

Most importantly, Applicants submit that claims 13-15 are not anticipated by Chen because each and every element of claims 13-15 is not described, either expressly or impliedly by Chen. For example, there are absolutely no teachings in Chen that either expressly or impliedly suggest varying the rate for reporting channel quality information as a function of the number of base stations that the mobile is communicating with, as recited in Applicants' claim 13. This feature of Applicants' claimed invention, which is particularly advantageous for handling "soft handoffs", is supported in Applicants' specification, see, e.g., page 9, lines 1-22. Because Chen does not teach or suggest each of the limitations recited in claim 13, Applicants submit that the Chen reference therefore does not anticipate claim 13 and respectfully request that the Examiner withdraw the rejection accordingly. Because claims 14 and 15 depend from claim 13, these dependent claims are therefore also believed to be allowable for the same reasons set forth above for claim 13 as well as for other novel features therein.

Claims 1, 4-12

Applicants submit that claims 1 and 4-12 are not anticipated by Chen because each and every element of claims 1 and 4-12 is not described, either expressly or impliedly by Chen. Contrary to the Examiner's assertion otherwise, both in the statements of the rejections and in

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response to Applicants' arguments from the previous Office Action response. Applicants submit that Chen does not describe, either expressly or impliedly, at least the following limitations recited in Applicants' claim 1 (and claim 11 which has similar limitations):

- mobile station reports channel quality information at a first rate in the absence of a reception of a data transmission from the base station; and
- upon detection of a reception of a data transmission from the base station, the mobile station reports channel quality information at a second rate for a prescribed duration.

Chen is concerned with adjusting the appropriate power level for transmitting data in order to avoid data loss, to extend battery life in a mobile, and so on. Power control, as described by Chen, is important especially for higher rate data transmissions because transmitting data at higher rates requires higher power (see, e.g., col. 3, lines 40-47 and col. 6, lines 49-59). In one embodiment, Chen describes a mobile (receiver) being instructed by the base station to send more power control information (e.g., at a higher rate) for a specified time period preceding the data transmission, so that appropriate adjustments to power can be made by the base station before sending the high rate data transmission to the mobile (see, e.g., col. 3, lines 48-54). In yet another embodiment, Chen describes the case where: 1) the link can be operating at the idle rate; 2) that data is then received at the base station for subsequent transmission to the mobile; 3) that the base station instructs the mobile to send more power control information (e.g., on the reverse link); and 4) thereafter, the base station adjusts its power level and then sends the data transmission at a higher rate to the mobile (see, e.g., col. 11, line 40 to col. 13, line 10).

These teachings are quite different from Applicants' claimed invention. As recited in claim 1, a mobile sends channel quality feedback to a base station at different rates depending on whether there is an absence or presence of a data transmission from the base station to the mobile. That is, the trigger for changing the rate of channel quality feedback from the mobile to the base station is whether there is a data transmission received by the mobile from the base station. Using the actual data transmission from the base station as a trigger for the mobile station to change its rate of transmitting channel quality information back to the base station, as claimed by Applicants, is quite different from the teachings of Chen. In Chen, the rate of transmission of power control information over the reverse link (assuming for argument purposes that the power control information is "feedback") is varied as a function of the mobile receiving an instruction from the base station before (i.e., in preparation of) the base station sending the data transmission to the mobile. Accordingly, Chen does not teach varying

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feedback from the mobile based on the absence or presence of a data transmission from the base station to the mobile.

Furthermore, Applicants respectfully submit that Chen fails to teach or suggest, contrary to the Examiner's assertion otherwise, a mobile station that, upon detection of a reception of a data transmission, reports channel quality information at a second rate for a prescribed duration. In particular, Chen only teaches that the bandwidth, and hence the rate of transmission, of power control information from the mobile station is increased in response to the instruction from the base station. Chen is silent about transmitting this information at a different rate for a prescribed duration.

Referring now to the Examiner's responses to Applicants' previous arguments in conjunction with Chen's FIG. 7 and accompanying description (col. 11, line 40 to col. 14, line 20), portions of which are cited in the Examiner's response to Applicants' arguments, Applicants respectfully submit that routine 300 described by Chen must be viewed in a larger context instead of any particular step in isolation. As described for step 320, data is "presented" to the base station for a high rate transfer to the mobile. Step 330 recites "tell the receiver to increase bandwidth of power control information about forward link". Note that Chen does not teach that data transmission occurs yet, but only that the base station and mobile are preparing for such data transmission by one instructing the other to increase the rate of sending power control information so that appropriate power adjustments can be made to support the subsequent data transmission. Subsequent steps, including step 360, describe the adjustments then made to the forward link (i.e., power) culminating in the subsequent data transmission from the base station to the mobile in step 380.

Step 360, in particular, recites "control the power level of the transmitter using low, full or high rates...to set the correct high rate power level for the transmitter". As described throughout the specification, Chen is referring specifically to the process that occurs before any data transmission occurs, whether it's via the forward link from base station to mobile as described in the embodiments, or whether it's via the reverse link as inferred by the Examiner in the Office Action. Accordingly, Chen does not describe or even suggest varying the rate of channel quality feedback from the mobile to the base station as a function of the mobile receiving the data transmission from the base station. Instead, Chen only describes the base station receiving data for subsequent transmission to the mobile and, to prepare for such transmission, instructing the mobile to vary the rate of feedback (power control information) from the mobile to the base station so that appropriate power levels can be set at the base station before sending the data transmission to the mobile.

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With respect to the Examiner's response to Applicants' arguments from the first Office Action, Applicants respectfully disagree with the Examiner's interpretation and characterization of the teachings in Chen at col. 13, lines 20-65 and lines 55-65 in particular. This portion of Chen (or any other portion for that matter) does not describe varying the rate for reporting channel quality information from a mobile to a base station as a function of the absence or detection, by the mobile, of a data transmission from the base station, contrary to the Examiner's assertion otherwise.

Applicants do agree generally with the Examiner's statement that Chen teaches that the mobile [and base station] can estimate and then test the proper power level necessary to send data at the high rate. However, this statement simply reinforces the fact that Chen teaches a mobile and base station exchanging and adjusting power control information (estimating, testing, etc) prior to the actual high rate data transmission occurring between the mobile and the base station. This is quite different than Applicants' claimed invention in which the rate of the channel quality information provided by the mobile is varied based on the presence or absence of the data transmission from the base station to the mobile.

Moreover, the cited portion of disclosure from Chen at col. 13, lines 20-65 (see lines 20-32 in particular), describe a completely different scheme than that being claimed by Applicants. For example, in this cited portion, Chen discloses that the base station stores a power level that was previously measured when data was previously sent and the base station simply recalls a previous power level for a subsequent data transmission. Here, Chen is not even describing varying the rate of any power control information feedback from the mobile to the base station.

With regard to the cited portion of Chen at col. 13, lines 33-40 discussing the situation of a transmission that is to occur via the reverse link from mobile to base station, Applicants again must disagree with the Examiner's characterization of the Chen teaching as being anticipatory of Applicants' claimed invention. Chen is describing a situation in which the reverse link is operating at idle (e.g., 1/8th rate) and "data is received for transmission along the reverse link" (emphasis added). Applicants submit that, upon careful reading and consistent with the entire disclosure in Chen, this statement simply refers to data being received at the mobile (e.g., from a user) for subsequent transmission along the reverse link (i.e., to the base station as the Examiner points out). That is, this embodiment refers somewhat to the converse of preceding embodiments, wherein here the mobile receives data for subsequent transmission to the base station (but not from the base station) and, in response, the mobile increases to the full rate thus increasing the feedback bandwidth to the base station. Again, this embodiment in Chen is still

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is not the same as a mobile, in response to a data transmission from the base station, varying the rate of channel quality feedback, as claimed by Applicants.

Finally, while the Examiner appropriately acknowledges that the teachings in Chen are primarily directed toward the control being effected on the base station side, Applicants do not agree with the inferences or conclusions being drawn with respect to the capabilities of a mobile station in the context of the Chen teachings. In particular, the Examiner states that, in the context of the Chen teachings, the mobile station can have "its own capability in detecting the status of the base station in order to request or adjust to the appropriate power levels necessary whether to send data or channel quality reports back to the base station at a low rate or at a high rate" (emphasis added).

First, Applicants do not at all agree that Chen suggests this capability for a mobile (or a base station for that matter) and respectfully invite the Examiner to specifically point out how the teachings in Chen support such an interpretation. Instead, Applicants submit that the capabilities of a mobile are more accurately summarized by what Applicants stated previously. That is, consistent with the teachings of Chen as a whole, the capabilities to infer for the mobile would be that, in preparation for a subsequent data transmission over the reverse link to a base station, that the mobile may adjust its rate of transmission of power control information to the base station. As stated previously by Applicants, this is quite different than a mobile adjusting its channel quality feedback based on the presence or absence of a data transmission from the base station (e.g., over the forward link).

Moreover, Applicants respectfully submit that such general and liberal extensions of the teachings in Chen are not only unsupported by the disclosure in Chen, but are also not sufficient to establish a case for anticipation in which each and every element of the claimed invention must be found in Chen, which Applicants believe not to be the case for all the reasons set forth hereinabove.

Because Chen fails to teach or suggest each and every recited limitation in claims 1 and 11, Applicants submit that Chen therefore does not anticipate claims 1 and 11 and respectfully request that the Examiner withdraw the rejections accordingly. Because claims 4-10 and 12 each depend from respective base claims 1 or 11, these dependent claims are therefore also believed to be allowable for the same reasons set forth above for claims 1 and 11 as well as for other novel features therein that are not disclosed by Chen.

With regard to claim 8, for example, Chen does not teach or suggest estimated channel quality being used to derive a transmission format for a subsequent transmission, wherein the transmission format includes one or more parameters selected from modulation format, number

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of codes, and transmission rate. As previously discussed, Chen only teaches deriving the proper power level for a subsequent high-speed transmission. With regard to claim 9, Applicants respectfully disagree that the cited portions or any other portions of the Chen reference teach or suggest a base station receiving channel quality information from a mobile, estimating channel quality therefrom, and then calculating an amount of redundancy for retransmissions accordingly. At most, Chen describes transmitting a new transmission to a mobile using a previously stored power level for the link. This teaching is not at all the same or even suggestive of using estimated channel quality to calculate an amount of redundancy for retransmission of a previous transmission as claimed by Applicants.

In view of the foregoing, Applicants submit that Chen fails to describe, either expressly or impliedly, each and every element of Applicants' claims and, as such, Applicants' claims are not anticipated by Chen. Accordingly, Applicants' respectfully request entry of this Response After Final, reconsideration, and withdrawal of the rejections of claims 1 and 4-15.

Conclusion

Applicants believe that all pending claims stand in condition for allowance. Accordingly, Applicants earnestly solicit a Notice of Allowance. Any questions can be directed to the Applicants' attorney at the number below.

Respectfully submitted,

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Lucent Technologies Inc.
Date: 8/6/04